Regional Economic Development Models-- A Critical Appraisal Based on the International Trade Experience

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NOTE TO THE READER

This paper is the result of work performed by a member of the staff of the Corps of Engineers Center for Economic Studies. It is one of a series of such studies, to be issued from time to time, considered as being of technical interest to socio-economic water resources planners, principally within the Corps of Engineers.

These reports are in the nature of working papers. Their purpose is to encourage innovative thought and intellectual response. The views presented are strictly those of the authors and are not necessarily those of the Center for Economic Studies or other elements of the Corps of Engineers.

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PREFACE

The purpose of the following paper is to lay out more clearly than heretofore what is implied when one speaks of economic relations among regions or more fundamentally how one defines economic ties among regions of a country. The relationship between regions is often described as central to regional development planning but unfortunately the nature of this relationship is seldom made explicit. This discussion serves as a base from which to address two issues the understanding of which are essential for the proper employment of economic development models. The first issue, which is given explicit attention in the second part of the paper, is how much is really known in an empirical sense about those factors which bind regions of the United States together economically. The second issue, closely related to the first, is to question the validity of and draw into sharper relief the assumptions upon which models of regional economic development are predicated.

Critical to the ability to address these issues is the definition of economic closeness or economic integration which is developed in the first part of the paper. This discussion is based heavily on the dialogue and experience of defining international integration appearing in the international trade literature, and for this reason the first part of the paper tersely reviews the conceptual framework set forth at different places in this literature. Following this, the conceptual framework is applied to addressing the two issues outlined above.

Comments on this working paper are invited.

Regional Economic Development Models -- A Critical Appraisal Based on the International Trade Experience

Since the founding of the European Common Market there has been a steady increase in economists' interest in how various institutional arrangements affect international economic relations. In addition, there has been a growing concern with the problem of defining economic closeness or the extent of economic integration between nations. It has become evident that what constitutes interaction and what it implies must be understood before the institutional issue can be fully addressed. Regional economists have in like manner been concerned with policy issues which hinge on the relations among areas of a nation. For example, given a region with severe unemployment caused by a declining industry, the type of policy adopted should depend on the extent of interregional integration. If labor is highly sensitive to wage rate differentials, one policy is implied; if labor is immobile but willing to lower its reservation wage and capital is highly mobile, another policy is suggested. A large number of policies can be outlined but whether they involve operating through the region in question directly or through one or more other regions depends on the extent of mutual dependence between it and other regions.

Unfortunately, a discussion of what constitutes economic closeness among regions has not accompanied the study of interregional activity. This paper sets out to initiate such a discussion by first examining briefly what criteria for considering countries integrated have come

from the dialogue ongoing in the international trade literature. Applying these criteria to our knowledge of interregional relationships in the United States yields two central conclusions: at least certain groups of regions in this country are integrated or economically responsive to each other; and, knowledge about the strength of the interregional adjustment mechanisms is extremely limited. The main thrust of the paper is not, however, in its conclusions as much as it is in focusing attention on a framework which needs to be developed if the mechanisms which bind regions together are to be understood.

The conclusions themselves evolve from a two-step process which corresponds to the two major sections of the paper. As the derivation of the concept of regional dependency or integration from the trade literature is felt to be essential to the development of the discussion, the first section of the paper presents several concepts of integration presented by trade theorists and indicates the unifying elements of the several theories. At this point a working definition of integration, applicable to both the regional and national cases, is set out. The second section applies this definition to the regional case. It begins by outlining why the issue of integration was naturally overlooked by initial regional studies. The major part of this section, however, reviews eclectically the major studies which contribute to the determination of the extent of regional integration. A final section presents some concluding comments.

I. Some Concepts of International Integration

In the literature four different concepts or measures of economic integration have been presented. The four measures are associated with

1) the discussion of optimal currency areas in international trade, 2) the general discussion of customs unions, 3) the application of gravity models to explain the pattern of international trade, 4) the concept of bilateral balancing projected by Michaely. While only the dialogue on customs unions has concerned itself formally with the concept of economic integration, it will be seen that the four measures are basically similar and highly complementary.

The concept of integration within the literature on optimal currency areas is dependent upon the degree of factor mobility between or among countries [See 21].. With a substantial amount of trade assumed, the criteria for grouping countries into a single currency area is the high degree of factor mobility. (This follows from the theories of Ohlin and Iverson protesting the Ricardian assumption of international factor immobility.) In practice there has been little agreement on what constitutes adequate international mobility of factors. One example of this disagreement is the difference in views of Meade and Scitovsky regarding the Common Market. Meade [19] argues that the conditions for a single area do not exist, and that due to the lack of labor mobility flexible exchange rates among countries would be more effective. Scitovsky [24] , on the other hand, favors the idea of a single currency area for the European Economic Union based on the high degree of capital mobility, suggesting that a common currency may lead to a greater mobility of labor.

The concept of integration developed within the theory of customs unions is summarized by Balassa:

> We propose to define economic integration as a process and as a state of affairs. Regarded as a process, it encompasses measures designed to abolish discrimination between economic units belonging to different national states; viewed as a state of affairs, it can be represented by the absence of various forms of discrimination between various national economies. [1, p. 1]

In essence integration is the state of free operation of international price and income mechanisms; at a maximum it presupposes the unification of monetary, fiscal, social and counter-cyclical policies and requires the establishment of a supra-national authority whose decisions are binding on member states. Thus the concept of integration at any level implies a Pareto optimum welfare situation within the union. It is clear that this concept is closely allied with integration under the optimum currency area discussion. The free operation of the adjustment mechanisms will in fact promote increased factor mobility as labor and capital seek out the highest return. The criteria for defining a currency area, however, require the presence of factor mobility before the fact. The idea of potential mobility, and thus of potentially greater integration, are central to the gravity models; and it is this concept of integration to which we shall turn presently.

Gravity models for estimating the international flow of goods presents a slightly different idea of integration. Models of this type were introduced separately by Tinbergen [27] and Poyhonen [22] and expanded considerably by Linnemann [16]. These models make the possible level of trade between two countries directly dependent on the potential supply of the exporting country and the potential demand of the importing country while inversely related to resistance factors such as

distance and trade barriers.[1/] Potential supply and demand positions of various countries can be compared by comparing their national products and domestic market : total market ratios. (The latter generally moving roughly with the populations differences among countries.) Generally, the gravity model formulation can be viewed as a special case of the customs union concept: it is special because it relies heavily on the income adjustment mechanism for realization of the fruits of integration. The price mechanism is seen as acting only to correct temporary disequilibria and not as being a long run determinant of trade and growth.

The final concept of integration to be examined is that implied by Michaely [20] in his discussion of bilateral and multilateral balancing of trade. The simplest method of explaining these balancing concepts is to discuss their measurement. If T_j is the degree of multilateral balancing for country j expressed as a percent, then

$$T_j = 1/2\ (100) \left[\frac{x_{sj}}{x.j} - \frac{M_{sj}}{M.j}\right]$$

where x_{sj} is the exports of j to s; M_{sj} is imports by j from s; x.j is j's total exports; and M.j is j's total imports. The potential range of the index is from zero to 100. It is zero when the proportion of each

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1/ Linnemann, [16], asserts that distance is not a barrier because of transportation costs but rather due to "dynamic factors": transportation requires time and thus reduces flexibility in the market; and to "psychic" distance: propinquity leads to better information, and greater familiarity with the laws and customs of the other country. (pp. 27-28.)

country's share in j's imports equals j's share in their exports; this is perfect bilateral balancing. The index is 100 when the country in question buys nothing from countries to which it exports and vice versa. Michaely's interest in the concept of integration stems from the classification of countries as bi- or multi-laterally balanced in their trade. His conclusion that the typically multi-lateral country is small, underdeveloped, primary-goods producing economy and that bilateral countries are large, developed, and diversified reflects some of the elements required for integration of national economies. A high degree of bilateral balancing is partially indicative of integration; only partially because the relative importance of the trade with the foreign country to the home country must also be considered. This is to say that the United Kingdom and Finland may exchange the same value of goods annually but they could not be considered integrated on this basis alone because of the difference in the relative importance of the imports to each country.

Although the concept of bilateral balancing is in itself incomplete, its implications are very similar to those of the first three concepts. To encourage bilateral balancing, restrictions on trade and pricing and income must be abolished. The policy implications and rewards to unrestricted operation of these mechanism, whether it be the recognition of economics of scale or higher proportions of mutual trade, all are

the result of exploitation of comparative advantage and are the unifying elements in these several concepts of integration.[2/]

One point to be emphasized is that in all of the perceptions of integration, it has been the degree of closeness which has been of concern; the study of integration is necessarily one of degree. It follows, then, that the definition of economic integration is based on the degree to which countries or regions react to each other. Thus integration may be defined as the presence of mutual economic dependency which is produced through the operation of the adjustment mechanisms. Further, the minimum amount of dependency required can be defined as the presence of a systematic influence, i.e. a statistically significant relation, between the two countries operating through the adjustment mechanisms. In international trade one country influences another primarily through its demand for the other's imports with adjustments being carried out through incomes and prices of both countries. In the interregional case, on the other hand, adjustments to changes in either the demand for imports or in the demand for factors of production will involve regional incomes and the prices of goods as well as the supply of productive

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2/ In measuring integration, these efforts have concentrated on the response of between country demands, exports and imports, to changes in the basic economic factors of national income and prices. For Michaely and those using gravity models the measure has been the average propensities to import and export, with countries with greater mutual trade being assumed to be more closely integrated. This approach is inaccurage due to the inapporpriateness of using average propensities for measuring imports and the neglect of effects resulting from changes in national incomes. The other main form of measurement has been to use marginal shares and include secondary effects on national income as well as on foreign trade sector. A discussion of this approach and an extension of it is contained in Struyk [26].

factors. We now turn to determining to what extent this idea of integration has been reflected in studies of regional economics and what is known about the interregional adjustment mechanisms.

II. Integration and Regional Economics

In spite of major theoretical and applied research in at least two of the areas discussed above under the concept of integration, i.e. development of gravity models and studies of factor mobility as the analog to the optimum currency area discussion, there has been little concern in regional economics with the idea of economic integration of regions.[3/] To appreciate why this has been the case requires that we look briefly at the evolvement of regional economics, and the possible role for integration within this changing framework.

Two issues with which regional science was necessarily concerned from the start were defining boundaries of a region and explaining the regional growth process. In constructing an operational theory in both of these areas strong assumptions regarding the functioning of the price and income adjustment mechanisms were made. Export base theory held that in response to some external shock such as increased labor productivity in a particular region the price mechanism would operate to clear the market of

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3/ Actually, the gravity models appeared in regional economic literature first through efforts by Ziph and Stewart among others. The evolvement of the concept and a discussion of its applications, which unfortunately does not stress the shortcomings of this type of analysis, are found in Isard, [14, Chapter 11]. Because of the inability to attach a casual interpretation to much of the findings of models thus giving low explanatory, although possibly high predictive, value to the model and because of the course of the general development of regional economics away from this approach, the role of the gravity model is not further discussed here.

the additional exports from this region at the new equilibrium price. Perfect competition and a stable price adjustment process on the demand side were assumed. Likewise the assumptions made regarding the response of factors of production to economic incentives had even more sweeping implications. For example, an increase in export demand in a given region would cause its investment schedule to shift upwards thus inducing a capital inflow, and a consequential in-migration of labor.[4/] This means that the export multipliers could be formulated given an infinitely elastic supply schedule.

These assumptions have been incorporated to a large extent in the defining of regions in practice. If we consider Fox's functional economic area to offer a reasonable criterion for the delineation of regions, it is seen that the basic criterion becomes thelimits of labor commutation to a given central point, based on the existing transportation technology.[5/] This has become the main criterion because a substantial degree of interregional trade is assumed (as is the functioning of the adjustment mechanisms on the demand side) and the operation of

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4/ The movement of capital into a trade surplus area is at odds with the usual payments adjustment model. For example, Borts says the "transfer of resources is accomplished when the lender or grantor experiences a surplus in its current account balance of payments, offset by a deficit in its capital or transfer accounts." [3, p. 155]. However, Whitman [28] demonstrates convincingly that capital flows into a surplus region. Instead of assuming that initial surpluses or deficits on current account are "financed" by accommodating capital flows, her "common-cause hypothesis" regards changes on both the current and capital accounts as stemming from shifts in the marginal efficiency of capital within the region.

5/ See Karl Fox, J. K. Sengupta, and Erik Thorbeck [11] Chapter 12.

a well organized capital market is implied to be general. The limiting factor, then, is labor which though mobile is less so than capital.

It becomes clear that differential strengths of responses to changes in the economic parameters have not been seriously considered at this stage because all markets were assumed to be operating efficiently. This does not imply that the responses of all regions were identical, owing to regional differences in resource allocation. At the same time, however, economists recognized the unrealistic nature of completely demand-oriented theory of regional emergence and of the assumption of very highly mobile factors of production became more obvious. This realization was strongly stated by Borts and Stein in their conclusion that differences in the growth rate of manufacturing employment (a basic cause of between state income variance) could be attributed to the elasticity of the supply of labor facing a specific industry and the factors shifting the labor supply function for the manufacturing sector.[6/] It has been generally realized by now that the factors of production have not been highly mobile over time; and, although less thoroughly demonstrated, the complete efficacy of the price mechanism in interregional demand studies has at least been seriously questioned.

Empirical work on the operation of the adjustment mechanisms for changes in the demand for goods is very limited. The only evidence on the regional price adjustment mechanism is for the demand of Nova Scotian

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6/ This, of course, is an oversimplification of their findings. For a succinct statement of their conclusions see the summary chapter, Chapter 10, [4].

manufactured goods by the rest of Canada for which Czamanski estimated the price eleasticity as -1.5 [8]. This is clearly an encouraging finding, but not nearly evidence enough to support the hypothesis tacitly advanced in regional economics that the price mechanism works with greater strength among regions than among countries.[7/] Likewise, despite a number of theoretical formulations of the interregional income adjustment mechanism, only the recent study by Czamanski of Nova Scotia and earlier work by Vining for the U.S. have attempted to relate a regional economy to the national economy in a systematic way.[8/] The empirical work on the demand side has, of course, been generally restricted by the lack of interregional export and import data over time. As a result regional economists have necessarily concentrated their efforts on the adjustments to variations in the demand for the factors of production.

7/ This is to say that the response to the same change in prices would be greater in the regional case, due to the absence of restrictions and impediments of trading across national boundaries. At the same time the existence of national pricing policies by large corporations and pricing agreements reached under conditions of imperfect competition make it less obvious that the mechanism is even being allowed to operate in the regional context, let alone with greater power.

8/ Vining [29] attempts to relate regions in an interregional adjustment model, and gives crude figures for the Pine Bluff region. There certainly were a host of other export multipliers derived for individual regions during this period, which assumed that the impact on the region would be the same regardless of the source. For a review of some of these [14], Chapter 6, Sections C and D, pp. 189-212. A great deal of information on regional interrelationships is summarized in various regional input-output models. Although they indicate to a certain extent the workings of the income adjustment mechanism, their structure assumes a number of the aspects of interregional behavior in which we are most interested. Nevertheless, they have served to support the theory that the interregional income mechanism does work with considerable strength.

Given the availability of data on factor movements over time, especially for labor, regional economists have studied the causes of these patterns carefully. Though largely unintentional, this stress on the supply side is in keeping with the increased importance of the supply response in the regional context as suggested earlier. Studies of special importance are those which have been concerned with the convergence of regional incomes over time reflecting interregional movement of factors in response to economic incentives. Characteristic of the findings of these studies is the conclusion of J. T. Romans:

> The relatively high positive correlation between per capita income and net exports indicates, at least tentatively, that the equilibrating forces acting on interregional income differentials dominate the disequilibrating ones. Capital tends to flow toward low income regions because the marginal efficiency of capital is higher there, or because high income states have a surplus of savings to export, or both. [23, p. 106].9/

The importance of these general findings is that factors of production do respond, although sluggishly in certain cases, to economic factors. There is then a systematic relation established over time between regions as surplus regions invest capital in deficit regions where the return to capital is greater. The process is reinforced through labor migration. This existence of a systematic relation among regions was cited earlier as the minimum criterion for considering areas, national or regional, to be integrated. In the international trade case this criterion is satisfied by the import demand functions. The stress on the responsiveness

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9/ Borts and Stein concert that the "pattern seems to be tending towards an intertemporal competitive equilibrium ..." (p. 214). The idea that incomes are converging implying the mobility of factors, is also held by Easterlin [9], and Hanna [12].

of the productive factors, however, is appropriate to the regional case. It should be clear, though, that it is not a complete criterion in itself just as a complete criterion in the national case would include both the supply and demand sides. The final step in this review of current knowledge of the adjustment mechanisms is to look very briefly at specific works on the response of capital and labor to various economic forces.

The studies on the functioning of the capital market have not produced much evidence of its responsiveness to investment opportunities. Romans' study, which comes the closest, is not able to produce data on the direction of the flows but rather only a statement as to which states were debtors or creditors. While it does show capital flowing to regions where its marginal revenue product is higher, Romans' study is unable to yield elasticity estimates, or discuss what time horizon is relevant in carrying out the adjustment process. In spite of these shortcomings, the study is invaluable as a starting point for further work. Other studies of the capital market are more concerned with the operation of the regional balance of payments adjustments and capital's role as a short term transfer item than with the movement of capital in response to higher returns. This is true of the studies by Hartland [13] and by Bowsher et al. [5] of the transfer of funds among the Federal Reserve Districts. It seems that much more could be learned from these capital flow figures by considering them less in the framework of accommodating payments and more in terms of causally determined flows.

We will not attempt to review all of the mass of literature on regional labor migration which has become available in recent years. The general finding has been that a simple competitive model in which wages are used to represent net advantage has not found empirical justification.[10/] This basic finding, frequently repeated, has lead to the recasting of the basic theory. For example, Mazek [18] rejected factor payment differentials as an explanation of spatial mobility theorizing that migration is an unemployment equalizing process rather than a wage equalizing one. Probably the most realistic analytical framework developed to date is that by Muth [15] in which employment, migration, and wage rates along with other variables are simultaneously determined. Even in this case, however, wages are not a significant determinant for migration.

III. Concluding Comments

In collecting the evidence on the functioning of the regional adjustment mechanisms one is first confronted with the evidence from several sources that these mechanisms are working as reflected in the convergence of regional incomes over time. Looking more closely at specific adjustments there is less reason to be optimistic. For the demand for goods we have only one or two observations on the performance of these mechanisms, although the conclusions are on balance encouraging as to their strength. The response of factors of production to economic incentives is unclear. Proof of the movement of capital for this reason

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10/ See for example [2, 10, 17, 25].

as a factor of production is meager; for labor we are faced with the very real possibility that the price mechanism is, except for certain cases, quite ineffective.

The current situation in regional economics parallels in several respects that of international economics in the 1950's when the efficacy of the price mechanism was being seriously questioned. Even during this period, however, the strength of the income mechanism was largely accepted as it is today in regional economics. It has only been in recent years with improved empirical methods and estimates that international trade economists have felt confident enough in their knowledge of the price and income mechanisms to make serious statements on the economic effects of various institutional arrangements designed to promote increased international integration.[11/] For the regional economist to speak with equal confidence about schemes to promote employment or increase the growth rate of a particular region will require further basic research into the economic relations which bind regions together. In the meantime a systematic relating of the implications of other research bearing on these issues is essential. Without an elementary knowledge of these relations, statements on the implications of these schemes for other areas and the nation as a whole will necessarily be based on assumptions on the operation of the adjustment mechanisms which are of unknown validity.

11/ See for example [6, 7, 19].

REFERENCES

[1] Bela Balassa. The Theory of Economic Integration (Homewood, Illinois: Richard D. Irwin, 1961).

[2] Blanco, "The Determinants of Interstate Population Movements," Journal of Regional Science, Summer 1963.

[3] G. Borts, "Growth and Capital Movements among U.S. Regions in the Postwar Period," American Economic Review, May 1968.

[4] G. Borts and J.L. Stein. Economic Growth in a Free Market (New York: Columbia University Press, 1964).

[5] N. Bowsher, J.D. Drane, and R. Einzig, "The Flow of Funds Between Regions of the United States," Papers of Regional Science Association, 1957, pp. 142-45.

[6] D. P. Calleo. Britain's Future (New York: Horizon Press, 1968).

[7] R. Cooper. The Economics of Interdependence (New York: McGraw-Hill, 1968).

[8] S. Czamanski. An Econometric Model of Nova Scotia (Halifax: Dalhousie University, 1968). Multilith.

[9] Richard Easterlin, "Long Term Regional Income Changes: Some Suggested Factors," Papers of the Regional Science Association, 1958, pp. 313-25.

[10] B. Fleisher, "Some Economic Aspects of Puerto Rican Migration to the U.S.," Review of Economics and Statistics, August 1963.

[11] Karl Fox, J.K. Sengupta, Erik Thorbeck. Quantitative Economic Policy (Chicago: Rand McNally and Co., 1966).

[12] Frank Hanna, "Analysis of Interstate Income Differentials: Theory and Practice," Regional Studies in Income and Wealth, Vol. 21 (Princeton: Princeton University Press for the National Bureau of Economic Research, 1957).

[13] Penelope Hartland, "Interregional Payments Compared with International Payments," Quarterly Journal of Economics, August 1949.

[14] W. Isard. Methods of Regional Analysis (Cambridge: M.I.T. Press, 1961).

[15] R.F. Muth in Charles L. Levin (ed.). Development Benefits of Water Resource Investment (Washington: U.S.A. Engineer Institute for Water Resources, 1969). Multilith.

[16] H. Linnemann. An Econometric Model of International Trade Flows (Amsterdam: Worth-Holland Publishing Co., 1966).

[17] Ira Lowry. Migration and Metropolitan Growth: Two Analytical Models (San Francisco: Chandler Publishing Co., 1966).

[18] W. Mazek. The Efficacy of Labor Migration, Working Paper (WR 2, Washington University, Institute for Urban and Regional Studies, 1966).

[19] J.F. Meade, "The Balance of Trade Problems in a Free Trade Area," Economic Journal, September 1957.

[20] M. Michaely, "Multilateral Balancing in International Trade," American Economic Review, September 1962.

[21] R.A. Mundell, "A Theory of Optimum Currency Areas," American Economic Review, December 1961.

[22] P. Poyhonen, "Towards a General Theory of International Trade," Ekonomiska Samfundete Tidskrift, Series 3, #2, 1963.

[23] J.T. Romans. Capital Exports and Growth among U.S. Regions (Middletown, Connecticut: Wesleyan University Press, 1965).

[24] Tibor Scitovsky. Economic Theory and Western European Integration (Stanford: Stanford University Press, 1958).

[25] L. Sjaastad, "Costs and Returns to Human Migration," Journal of Political Economy, Supplement, October 1963.

[26] R. Struyk. A Positive Study of International Economic Integration, unpublished Ph.D. dissertation, Washington University, 1968.

[27] Jan Tinbergen. Shaping the World Economy: Suggestions for International Policy (New York: Twentieth Century Fund, 1962).

[28] M. von Newmann Whitman. International and Interregional Payments Adjustments: A Synthetic View, Princeton Studies in International Finance No. 19 (Princeton: Princeton University Press, 1967).

[29] R. Vining, "The Region as a Concept in Business Cycle Analysis," Econometrica, July 1946.